

Same-side and opposite-side tagging for $B_s \rightarrow \mu\phi\pi$ decay mode

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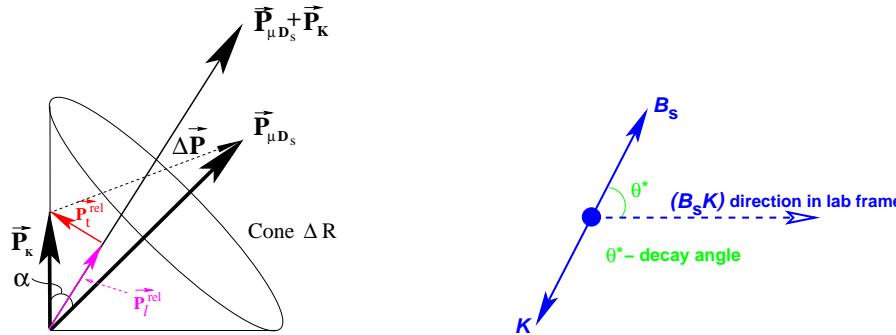
http://www-d0.fnal.gov/~rakitin/d0_private/tex/2007.May.31.Bmix/tr.pdf

List of used same-side taggers:

We are using the following SSTs (one-track and many-track taggers):

- ☞ Min. p_t^{rel}
- ☞ Max. p_L^{rel}
- ☞ Max. p_t
- ☞ Min. $|\Delta \vec{P}| \equiv |\vec{p}(B_s) - \vec{p}(K)|$
- ☞ Best: Min. ΔR
- ☞ Max. $\cos \alpha$
- ☞ Min. $\cos \theta^*$
- ☞ Max. $\cos \theta^*$
- ☞ Min. $m(B_s K)$
- ☞ Random track

- ☞ $Q_{\text{jet}}(p_t, \kappa) = \frac{\sum q \cdot p_t^\kappa}{\sum p_t^\kappa}$
- ☞ $Q_{\text{jet}}(p_t^{\text{rel}}, \kappa) = \frac{\sum q \cdot (p_t^{\text{rel}})^\kappa}{\sum (p_t^{\text{rel}})^\kappa}$
- ☞ $Q_{\text{jet}}(p_L^{\text{rel}}, \kappa) = \frac{\sum q \cdot (p_L^{\text{rel}})^\kappa}{\sum (p_L^{\text{rel}})^\kappa}$
- ☞ Best: $Q_{\text{jet}}(p_t, \kappa = 0.6)$



- One-track: p_t^{rel} and p_L^{rel} are \perp and \parallel components of SST candidate's momentum $\vec{p}(K)$ w.r.t $\vec{p}(B_s K)$
- $\Delta R \equiv \sqrt{\Delta\phi^2 + \Delta\eta^2}$ and angle α are taken between $\vec{p}(B_s)$ and $\vec{p}(K)$
- θ^* – decay angle of $B_s K$ -system, i.e. angle between directions of $\vec{p}(B_s K)$ and $\vec{p}(B_s)$ in reference frame of $B_s K$ system
- $\kappa = 0.0, 0.1, 0.2, \dots 1.0$
- Q_{jet} : p_t^{rel} and p_L^{rel} are \perp and \parallel components of SST candidate's momentum $\vec{p}(K)$ w.r.t $\vec{p}(B_s)$



Comb. SST in $B_s \rightarrow \mu D_s X$ MC

- “Min. ΔR ” and “ $Q_{jet}(p_t, 0.6)$ ” are best taggers for both $J/\psi\phi$ and $\mu\phi\pi$ decay modes
- Use class TagCombinedSame in BANA package
- **Combination improves results compared to individual taggers**
- The results depend on the level of trust to Monte Carlo:
 - If we do not match B_s decay products to the tracks, ϵD^2 is lower
 - If we do match them, ϵD^2 is factor of 2 – 3.5 higher
- Use two MC $\mu\phi\pi$ samples: from p17 MC website and “unbiased” MC

	Tagger	$\epsilon, \%$	$D, \%$	Unbinned $\epsilon D^2, \%$	Binned $\epsilon D^2, \%$
19	“Min. ΔR ”	80.6 \pm 2.7	12.1 \pm 2.5	1.19 \pm 0.48	1.32 \pm 0.51
	“ $Q_{jet}(p_t, 0.6)$ ”	89.6 \pm 2.9	9.8 \pm 2.3	0.85 \pm 0.41	1.89 \pm 0.60
	“Comb. SST”	89.6 \pm 2.9	11.9 \pm 2.3	1.26 \pm 0.50	1.36 \pm 0.51
40019	“Min. ΔR ”	78.7 \pm 6.8	16.9 \pm 6.4	2.26 \pm 1.72	4.31 \pm 2.12
	“ $Q_{jet}(p_t, 0.6)$ ”	89.3 \pm 7.5	13.4 \pm 6.1	1.61 \pm 1.46	4.66 \pm 2.31
	“Comb. SST”	89.3 \pm 7.5	12.7 \pm 6.1	1.44 \pm 1.38	3.65 \pm 2.14
199	“Min. ΔR ”	80.3 \pm 2.7	5.2 \pm 2.5	0.22 \pm 0.21	0.69 \pm 0.37
	“ $Q_{jet}(p_t, 0.6)$ ”	89.5 \pm 2.9	5.4 \pm 2.4	0.26 \pm 0.23	0.58 \pm 0.34
	“Comb. SST”	89.5 \pm 2.9	6.0 \pm 2.4	0.32 \pm 0.25	1.01 \pm 0.44
40	“Min. ΔR ”	79.7 \pm 1.9	10.4 \pm 1.7	0.87 \pm 0.29	1.25 \pm 0.34
	“ $Q_{jet}(p_t, 0.6)$ ”	89.1 \pm 2.0	18.5 \pm 2.7	1.08 \pm 0.32	1.15 \pm 0.33
	“Comb. SST”	89.1 \pm 2.0	10.3 \pm 1.6	0.92 \pm 0.30	1.72 \pm 0.39
140	“Min. ΔR ”	80.1 \pm 1.9	10.4 \pm 1.8	0.86 \pm 0.29	1.23 \pm 0.35
	“ $Q_{jet}(p_t, 0.6)$ ”	31.8 \pm 1.0	18.2 \pm 2.8	1.05 \pm 0.32	1.12 \pm 0.33
	“Comb. SST”	87.8 \pm 2.0	10.1 \pm 1.7	0.90 \pm 0.30	1.68 \pm 0.40
240	“Min. ΔR ”	72.4 \pm 0.3	6.5 \pm 0.3	0.31 \pm 0.03	0.42 \pm 0.03
	“ $Q_{jet}(p_t, 0.6)$ ”	34.1 \pm 0.2	8.1 \pm 0.4	0.22 \pm 0.02	0.23 \pm 0.02
	“Comb. SST”	80.7 \pm 0.3	6.3 \pm 0.3	0.32 \pm 0.03	0.44 \pm 0.03
340	“Min. ΔR ”	79.7 \pm 2.0	10.3 \pm 1.8	0.85 \pm 0.30	1.25 \pm 0.36
	“ $Q_{jet}(p_t, 0.6)$ ”	32.0 \pm 1.1	18.2 \pm 2.8	1.06 \pm 0.33	1.15 \pm 0.34
	“Comb. SST”	87.5 \pm 2.1	10.0 \pm 1.7	0.88 \pm 0.31	1.64 \pm 0.40
440	“Min. ΔR ”	72.4 \pm 0.3	6.5 \pm 0.3	0.31 \pm 0.03	0.42 \pm 0.03
	“ $Q_{jet}(p_t, 0.6)$ ”	81.9 \pm 0.3	5.0 \pm 0.3	0.21 \pm 0.02	0.29 \pm 0.03
	“Comb. SST”	81.9 \pm 0.3	6.1 \pm 0.3	0.31 \pm 0.03	0.45 \pm 0.03
540	“Min. ΔR ”	79.7 \pm 2.0	10.3 \pm 1.8	0.85 \pm 0.30	1.25 \pm 0.36
	“ $Q_{jet}(p_t, 0.6)$ ”	89.1 \pm 2.1	8.9 \pm 1.7	0.70 \pm 0.27	1.42 \pm 0.38
	“Comb. SST”	89.1 \pm 2.1	9.7 \pm 1.7	0.83 \pm 0.30	1.61 \pm 0.40
640	“Min. ΔR ”	79.7 \pm 2.0	10.3 \pm 1.8	0.85 \pm 0.30	1.25 \pm 0.36
	“ $Q_{jet}(p_t, 0.6)$ ”	89.1 \pm 2.1	8.9 \pm 1.7	0.70 \pm 0.27	1.42 \pm 0.38
	“Comb. SST”	89.1 \pm 2.1	9.7 \pm 1.7	0.83 \pm 0.30	1.61 \pm 0.40
740	“Min. ΔR ”	80.1 \pm 1.9	10.4 \pm 1.8	0.86 \pm 0.29	1.23 \pm 0.35
	“ $Q_{jet}(p_t, 0.6)$ ”	89.3 \pm 2.1	8.9 \pm 1.7	0.71 \pm 0.27	1.38 \pm 0.37
	“Comb. SST”	89.3 \pm 2.1	9.8 \pm 1.7	0.86 \pm 0.29	1.64 \pm 0.40
2098	“Min. ΔR ”	74.6 \pm 0.2	7.0 \pm 0.2	0.36 \pm 0.02	0.50 \pm 0.03
	“ $Q_{jet}(p_t, 0.6)$ ”	83.3 \pm 0.2	5.5 \pm 0.2	0.25 \pm 0.02	0.35 \pm 0.02
	“Comb. SST”	83.3 \pm 0.2	6.4 \pm 0.2	0.34 \pm 0.02	0.65 \pm 0.03
42098	“Min. ΔR ”	74.6 \pm 0.2	7.0 \pm 0.2	0.36 \pm 0.02	0.50 \pm 0.03
	“ $Q_{jet}(p_t, 0.6)$ ”	83.3 \pm 0.2	5.5 \pm 0.2	0.25 \pm 0.02	0.35 \pm 0.02
	“Comb. SST”	83.3 \pm 0.2	6.6 \pm 0.2	0.36 \pm 0.02	0.57 \pm 0.03
2100	“Min. ΔR ”	74.6 \pm 0.2	7.0 \pm 0.2	0.36 \pm 0.02	0.50 \pm 0.03
	“ $Q_{jet}(p_t, 0.6)$ ”	83.3 \pm 0.2	5.5 \pm 0.2	0.25 \pm 0.02	0.35 \pm 0.02
	“Comb. SST”	83.3 \pm 0.2	6.6 \pm 0.2	0.36 \pm 0.02	0.34 \pm 0.02